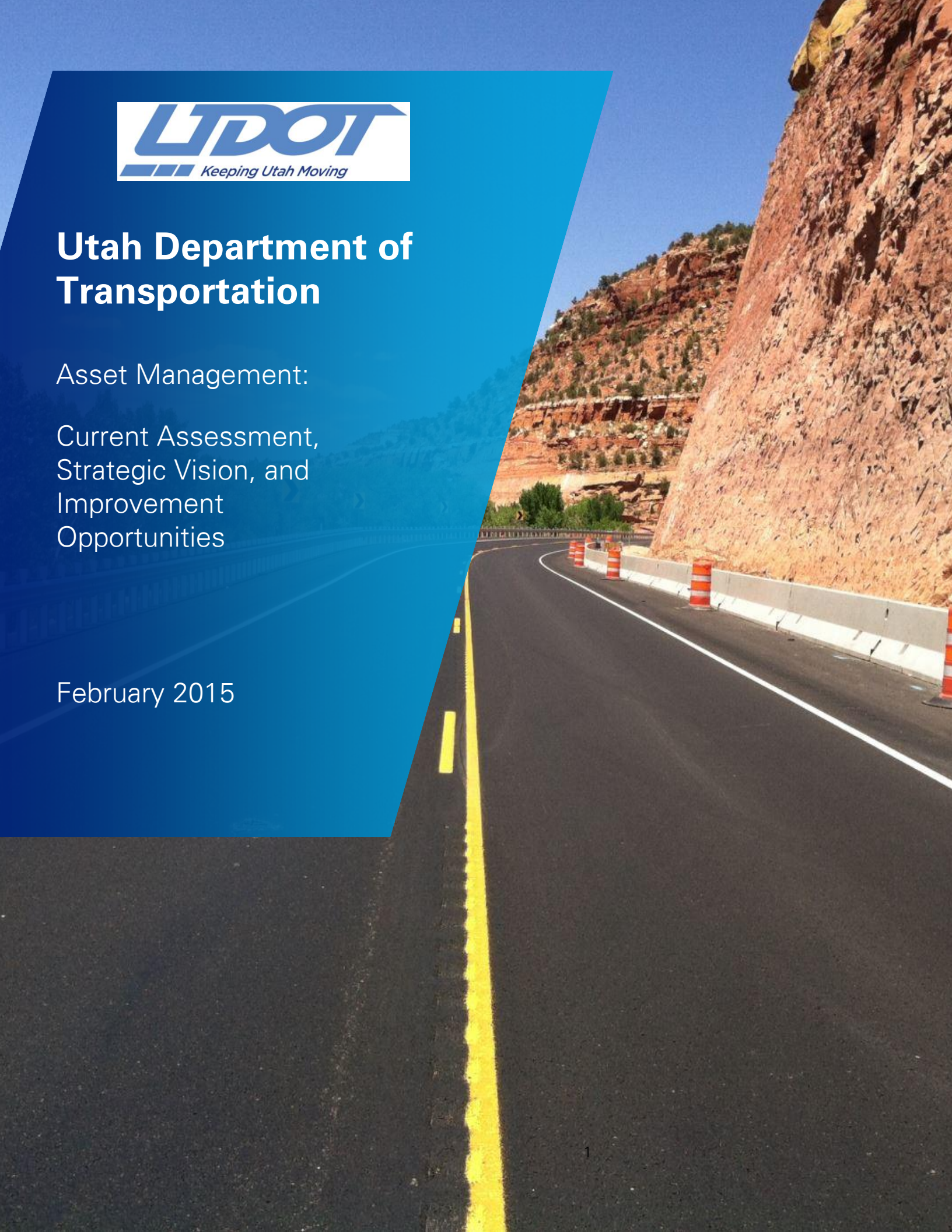


Utah Department of Transportation

Asset Management:

Current Assessment, Strategic Vision, and Improvement Opportunities

February 2015

Executive Summary

Background

UDOT's asset management program has been evolving for the past four decades, shifting as both needs as well as available technologies have changed. With the creation of the Asset Management Division in the early 2000s, as well as the development of the DOT's Asset Management Strategic Plan, UDOT has started to institutionalize a broad-based strategic approach to asset management – moving from individual maintenance plans for segments of pavement towards a strategic asset management approach.

The objective of this engagement was to help UDOT set up a plan of action for the improvement of its strategic asset management capabilities and for the realization of cost savings over both the near term as well as sustained efficiencies and savings over the long term. To ensure the sustainability of the expected savings, this project has focused on assessing UDOT's current asset management strategy, further developing and refining the organization's strategy and vision, and subsequently crafting an implementation guide to help the organization as it seeks to evolve its asset management program to the next level of maturity.

Project Structure

As depicted in the figure below, the project is organized around three main sequential components: a current state assessment, asset management vision and strategy, implementation guide and review of UDOT's Draft Transportation Asset Management Plan (TAMP).

The first workshop focused on the current state of UDOT's asset management practices. KPMG worked with UDOT to evaluate current organizational objectives, ongoing strategic asset management initiatives, maintenance practices, and to provide an overview of leading asset management practices and the six building blocks that make up a sound framework. This current state assessment was also informed by a

series of interviews conducted with key UDOT asset management staff. In addition, the project team reviewed the outcome of a previous asset management maturity assessment, evaluating the current state of UDOT's asset management program relative to the six building blocks.

The next workshop focused on working with UDOT to define the organization's vision of asset management and guiding principles. Key outcomes of this second workshop are detailed below:

- Definition of asset management: Coordinated innovative approach to analyzing, planning, investing, building, maintaining and operating our assets to "keep Utah moving."
- Asset management success: Driving the mission and vision of our organization by effectively, efficiently, and economically managing assets throughout their lifecycle.
- Management of asset risks: Balancing decisions based on lifecycle costs and minimizing or eliminating risks.
- Asset management analytics: Proactive asset management decisions driven by consistent, accurate, and timely information – and informed by institutional knowledge – with appropriate levels of analytics and data.
- Key asset management principles:
  - Our focus is to deliver value through our assets for our stakeholders
  - We apply integrated planning to achieve infrastructure sustainability
  - We apply the right level of detail for each asset class
  - We rely on people making informed risk based decisions
  - We foster coordination across the Department
  - We promote a culture of innovation
  - We continually improve our asset management processes

KPMG identified opportunities for improvement of asset management strategy based on a gap analysis comparing how UDOT defined asset management – as a coordinated innovative approach to analyzing, planning, investing, building, maintaining and operating assets to "keep Utah moving" – with the output of the current state self-assessment. The project team also took into account the various current initiatives underway at UDOT and the extent to which these activities were aligned and supporting one another. Within that context, the project team reviewed opportunities that had the potential to not only drive the program forward through the creation of new processes, policies, and initiatives but also to streamline and integrate the asset management activities already in place. Finally, the project team kept in mind specific guidance and comments made by attendees at the first two workshops and interviews.

Nine opportunities for UDOT to improve it's asset management program were identified and are listed below. As part of the opportunity identification and review

process, each opportunity was evaluated against the seven key asset management principles identified by UDOT in the visioning workshop. While opportunities were created to appeal to the largest number of principles possible, inherently not all opportunities will apply to all principles equally.

Review performance measures (PMs) and level of service (LOS) targets

- A targeted review should focus on LOS targets and PMs for defined asset classes, regions/corridors, or simply the metrics UDOT suspects are not correct; or UDOT can conduct a comprehensive review of all PMs and LOS targets.

FL Implement field activity feedback loops

- Develop processes in following areas to address current lack of feedback loops: tracking new initiatives / pilot projects, data / documents / asset management systems, major maintenance contracts.

RM Expand current risk matrix into organizational risk framework

- This should take into account the newly formed vision and principles for asset management, leveraging work already done as part of cross-asset allocation projects.
- Risk management at the asset level presently – should expand to an organizational / programmatic approach.

DR Dashboard reporting (financial – technical – operational)

- Should leverage quality asset data UDOT already has to more effectively – and quickly – communicate operational input & maintenance outcomes both externally and internally for improved asset management decision making, including financial, operational and technical reporting. This will also assist in UDOT's aspirations of being a transparent organization.

DSG Data / document strategy and governance plan

- Develop a plan and corresponding implementation strategy to align UDOT's data and document systems and initiatives. This will integrate and enhance business intelligence across the organization.

IP Integrate long-range planning with STIP

- Implement protocol to ensure STIP projects are consistent with and contribute towards outcomes of LRTP and UDOT's newly formed asset management vision and principles.

LCC approach for non-pavement assets (improving bridge, roadside, fleet, facilities)

- Increase understanding of Life Cycle maintenance Costs and asset replacement investments of non-pavement assets across the asset lifecycle.

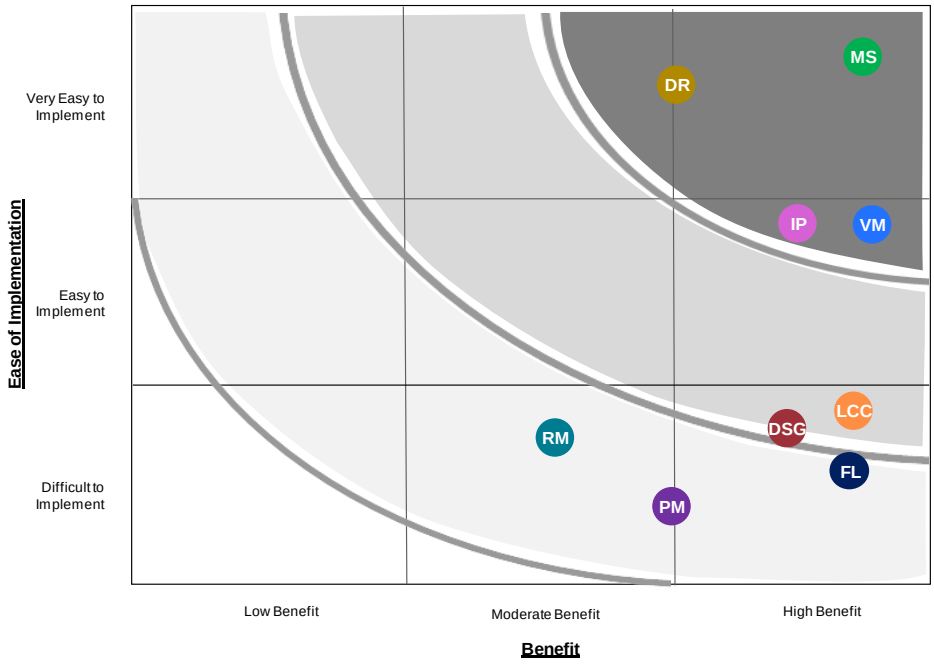
VM Organizational "values matrix" for optimized asset management decision making

- Develop transparent analytical process for determining the extent to which assets / projects contribute towards UDOT's strategic goals and objectives.

MS Asset management maturity strategy by asset class

- Determine extent and scope of asset management program and associated activities by each asset class. This will assist in the development of a unified programmatic approach to asset management.

After identification and review of potential opportunities for improvement, each opportunity was scored across two criteria – ease of implementation and benefit of implementation. Taken into account for both were monetary and non-monetary factors, including (but not limited to): amount of cultural / organizational change required, political considerations, policy initiatives, complexity, and leadership preferences. Clear wins were defined as those opportunities which were deemed very easy to implement (accounting for the aforementioned considerations) and had a high benefit of implementation. The scatterplot below depicts rankings of the opportunities following the final implementation workshop in February 2015.



In the final workshop, attendees noted the linkages between the various options and that virtually all assets could benefit from the implementation of the proposed alternatives. For example, pavement assets could benefit from developing a data and strategy governance plan for pavement data as well as from implementing dashboard reporting tailored to stakeholders' pavement data needs.

During the workshop the idea of developing a framework for each asset class was discussed. Under this concept, the requirements/needs for each asset class would be defined as they related to each of the implementation options (ie generating a framework that includes everything from perfomrnace measurement to asest management maturity strategy for each asset class) . Participants noted that this approach would lead to relatively siloed outcomes – that the resulting frameworks would only apply to one asset class. However, it was also stated that doing so could serve as merely an interim step before integrating all frameworks into a broad-based, organizational approach across all asset classes and implementation options. With the benefit of lessons learned from the development of the framework for each asset class – and resulting process improvements – this framework could then be applied to a larger number of assets as a refined process.

Finaly as part of this project, the KPMG team reviewed and evaluated UDOT's Draft Final TAMP issued in October 2014. In working towards fulfilling MAP-21's requirements for a TAMP,UDOT's TAMP begins to set the foundation for the strategic direction of the organization's asset management program. The project team observed that several opportunities exist to improve upon the foundation created in the current version of the TAMP. By tying the work done in the previous workshops – the development of an organization-wide vision and set of asset management principles – should be incorporated into the TAMP. In this sense, the TAMP should represent the culmination of UDOT's strategic asset management approach, aligning the asset management program around those core objectives and principles.

Introduction

Background

A number of potential cost savings opportunities were identified in the Phase I final report of KPMG's Asset Opportunities Study, dated November 15, 2013. With emphasis on asset management improvement, UDOT is interested in an action plan that may lead the organization to the realization of the expected benefits as highlighted in that study. Market examples and benchmarks identified during Phase I indicate that UDOT can potentially realize material cost savings (Opex and Capex) by implementing improved asset management practices. To ensure the sustainability of the expected savings, this project has focused on assessing UDOT's current asset management strategy, further developing and refining the organization's strategy and vision, and subsequently crafting an implementation guide to help guide the organization as it seeks to evolve its asset management program to the next level of maturity. The objective of this task order is to help UDOT set up a plan of action for the improvement of its asset management capabilities and for the realization of cost savings over both the near term as well as sustained efficiencies and savings over the long term.

Evolution of Asset Management at UDOT

UDOT's asset management program has been evolving for the past four decades, shifting as both maintenance needs as well as available technologies have changed. In the 1970s, UDOT's asset management program began with a focus on cost effectiveness, centered around the idea that "good roads cost less." As the DOT's network grew, and maintenance operations increased in scale and complexity, the focus evolved into developing comprehensive maintenance plans for pavements. This pavement optimization strategy differed from the traditional approach of "worst first" pavement maintenance, allowing UDOT to select treatments taking into account both relative costs and benefits. With the creation of the Asset Management Division (AMD) in the early 2000s, as well as the development of the Asset Management Strategic Plan, UDOT institutionalized a broader strategic approach to asset management – moving from individual maintenance plans for segments of pavement towards a strategic asset management approach. This shift allowed UDOT to begin implenting a variety of new asset management initiatives. From pavement distress surveys to developing bridge management competencies and responsibilities within the AMD, to implementing leading practices

in data gathering, collection, and management. UDOT has leveraged the experience gained along its asset management journey thus far to refine its asset management oversight structure and to initiate a draft of a MAP-21 compliant Transportation Asset Management Plan (TAMP) as well. These initiatives, in addition to the range of ongoing asset data initiatives, will be discussed at length later in this report.

KPMG's Prior Asset Management Work with UDOT

Since the Fall 2013, KPMG has been assisting UDOT in looking for opportunities to streamline its organization, drive efficiencies, and realize cost savings through the Asset Scan initiative. Since the conclusion of Phase I of the Asset Scan in November 2013, KPMG has been retained by UDOT to advance a variety of opportunities, including sponsorship of UDOT's assets.

In terms of asset management, KPMG conducted an asset management workshop in February 2014 focused on discussing how UDOT could optimize its asset management practices as it sought to further evolve towards an asset management organization. UDOT wanted to be able to understand:

- How to allocate limited funds to achieve its strategic goals;
- What asset condition targets should be for the elements of risk, safety, and budget; and
- If UDOT is spending its money in the best possible way.

As a part of this workshop, KPMG facilitated a preliminary UDOT asset management self assessment based off of the six key building blocks of the Institute of Asset Management's leading practice framework. As a result of this workshop, UDOT gained a critical view of the organization's current maturity within each key asset management-related competency. In addition to the questions UDOT had already addressed through the drafting of its TAMP, KPMG worked with UDOT to discuss its strategic objectives and vision for its asset management program – and how asset management activities and processes were established to support pursuit of both.

Key takeaways from this February 2014 workshop included the following:

- Asset management maturity self assessment findings showed a wide maturity range (strategy and planning)
- Asset management program at UDOT should demonstrate accountability, transparency, and cost effectiveness
- Lots of different initiatives are currently in progress – how can they be aligned?
- What is the right level of service (LOS) for each asset? How is that determined?

Structure of this Project

As depicted in the figure below, the project is organized around three main sequential components: a current state assessment, asset management vision and strategy, and implementation guide.

1) Current State Assessment

The objective of the current state assessment task was to understand the gap between UDOT's current asset management practices and the leading asset management framework. Additionally, this task was focused on establishing a current state baseline for benchmarking and assessing the capacity to move forward and enhance maturity of asset management practices. This current state assessment was also informed by a series of interviews conducted with key UDOT asset management staff.

2) Asset Management Vision and Strategy

This task was aimed at tailoring a unifying vision of the asset management program to close the asset management maturity gap identified in the assessment task. Identifying a common vision helps to align UDOT with becoming an asset management organization – one which has established the asset management functionality and competencies across the department.

3) Implementation Guide

With knowledge of the gaps between current UDOT asset management practices and the leading asset management framework – as well as our understanding UDOT's asset management vision – the KPMG team developed an implementation guide that would assist UDOT in improving current practices and work towards achieving the cost savings identified in the Phase I Asset Opportunities Study Final Report.

1) Current Asset Management Strategy at UDOT

Mission, Vision, Strategic Goals, and Definition of Asset Management

UDOT Mission and Vision

As shown on the UDOT website, the organization's vision is to "Keep Utah moving." This vision applies to UDOT as a whole, and was not crafted specifically for UDOT's asset management program. Similarly, UDOT's mission also applies to the organization as a whole. UDOT's mission statement tasks the organization with "innovating transportation solutions that strengthen Utah's economy and enhance quality of life."

UDOT Strategic Goals

As laid out in UDOT's 2014 Strategic Direction document, as well as UDOT's Draft TAMP, the organization has three strategic goals:

- Zero crashes, fatalities, and injuries
- Preserve infrastructure
- Optimize mobility

Zero fatalities has taken over as top priority as UDOT increases its focus on safety. To that end, UDOT considers that, as stated in its 2014 Strategic Direction document, "zero fatalities is the only goal" for network safety. Preserving infrastructure has long been one of the organization's strategic goals, dating back to the era of "good roads cost less" at UDOT. This objective is based on the notion that the most effective way to preserve the transportation system is to continue a regular schedule of upkeep to prevent deterioration. The "optimize mobility" objective is focused on working to more quickly and efficiently move people to their destination through optimizing operations and improving intermodal connections. Additionally, UDOT's recent push to facilitate capacity expansion projects represents a forward-looking element of this objective – building for the future by alleviating bottlenecks and traffic delays.

Definition of Asset Management

In the Draft TAMP, asset management is definied as "a crucial element" of UDOT's achievement of its strategic goals. Furthermore, asset management at UDOT helps the organization remain accountable to its key stakeholders (the driving public, taxpayers, and the state legislature, among others) by:

- Minimizing lifecycle costs
- Maximizing system performance
- Supporting an objective decision-making process

- Balancing public expectations with limited funding

UDOT views a "comprehensive" asset management process as one which includes the following areas, as identified in its Draft TAMP:

- Performance-based approach for allocating funds
- Data storage and accessibility
- Integration with the Long Range Transportation Plan
- Lifecycle cost analysis
- Risk management
- Organizational structure for asset management

Key Asset Management Initiatives

As illutrated in the figure below, a wide variety of initiatives are currenty underway at UDOT across the many activities, processes, and operations that relate to asset management.

This significant activity and range of current initiatives – from technical field initiatives to strategic policy projects – is consistent with both the organization's mission as well as a long-standing history and culture of innovation within the DOT. As the focus of this engagement was on enhancing UDOT's strategic asset management approach, the table below details some of the key strategy-level initiatives currently in process at UDOT.

Initiative	Description
TAMP	▪ Latest draft published in October 2014 ▪ MAP-21 compliant, includes all required risk elements ▪ Details strategic goals, as well as initiatives that will be undertaken to improve asset management processes

	▪ Reviews results of 2013 TRANSMAT Committee Gap Analysis, adding context to choices of initiatives ▪ Sets forth Asset Management Roadmap in three broad areas – program alignment, assets and performance, and organized and accessible data – for the ensuing 1, 3, and 5 year periods
Data Governance and Warehousing	▪ At a high level: working to foster data-driven decisions such that UDOT is able to, based on good data, chose the right project at the right time and at the right cost ▪ "UGoogle" development – enhancing the ability to search for data and query across integrated UDOT data platforms ▪ With increased integration, allocation will become a more efficient process that mirrors true asset "need" on the ground ▪ Data warehouse in development to serve as a central repository for all data – planning, operational, and technical data ▪ Augmenting data governance is being targeted as a means to close business intelligence and analytics gaps – the largest identified in the 2013 TRANSMAT Gap Analysis
Asset Management Governance	▪ Two committees formed, as part of the TAMP creation process, to help drive asset management from the top down ▪ TRANSMAT reformed and renamed the Asset Management Steering Council (AMSC), chaired by the Deputy Director and consisting of eight members ▪ AMSC focused on "ensuring horizontal and vertical communication and integration across the organization relative to asset management" and, in general, evaluating the direction of UDOT's asset management program annually ▪ Asset Advisory Committee (AAC) formed to "enhance communication flow between the strategic work of the AMSC and the 'boots on the ground'" technical experts. ▪ AAC chaired by the Asset Management Director and consists of designated division leaders
Cross Asset Resource Allocation	▪ Participating in NCHRP project to develop a performance-based cross-asset resource allocation framework ▪ Intended to address gaps in setting targets and allocating resources based on performance and agency risk preferences ▪ Developing a project-level risk register to support the project

Current Data Practices

Based on documentation received, as well as a series of interviews with key staff, the project team has reviewed – at a strategic level – UDOT's current data practices as they relate to asset management. Recommendations related to strategic data management going forward are detailed in Chapter 3 – Opportunities for Improvement.

UDOT has developed extensive data on both pavement and bridge assets, the result of formalized and robust data collection processes and procedures for those assets. By contrast, data on roadside and other non-tier 1 assets is much more variable in both quality and level of detail. No standardized approaches exist for these assets at present, though UDOT has made progress in inventorying assets fence-to-fence in select corridors (e.g. LiDar inventorying project). For non-pavement/bridge assets, it is not apparent how the data collected plays into asset decision-making at either the strategic or technical levels. By contrast – and in large part due to federal requirements – the link between tier 1 asset data and decision-making processes is both more developed and more consistently applied.

In interviews with key staff, the project team encountered mixed views on the utility of further expanding data collection efforts. Some interviewees felt that data collection efforts can always be expanded, and that there is always more information that could be captured about key network assets. By contrast, some felt that the cost-benefit and positive impact of collection going forward would be limited without first working to integrate that data and assess the ability of asset managers to make decisions with that data.

UDOT is currently in the process of developing a data warehouse to centralize data storage and establish a foundation for future cross-asset data integration and decision-making capabilities. In the longer-term, UDOT envisions capabilities for the data warehouse that will allow employees from across the organization to access condition, inventory, and other key asset management data for decision-making purposes. This notion of a "single source of truth" is beginning to play out on UDOT's asset management website, where inventory and condition data is posted for public consumption. Data is available to the public both as raw data as well as GIS overlays; while not fully integrated with technical and financial data, the website provides a glimpse of what a data warehouse could look like in the future.

UDOT TAMP – Key Observations

As a part of this project, the KPMG team reviewed and evaluated UDOT's Draft Final TAMP issued in October 2014. In addition to working towards fulfilling MAP-21's requirements for a TAMP, UDOT's TAMP begins to set the foundation for the strategic direction of the organization's asset management program. The project team observed several key components of the TAMP in its review, each of which is detailed below.

Detailed analysis of the TAMP, and opportunities for improvement, are detailed in Chapter 3 – Opportunities for Improvement.

Establishment of a new asset management governance structure

- Creation of a new governance structure to provide recommendations to the Transportation Commission for approval that maximize system performance and funding
- TRANSMAT reformed and renamed the Asset Management Steering Council (AMSC), chaired by the Deputy Director and consisting of eight members
- AMSC focused on "ensuring horizontal and vertical communication and integration across the organization relative to asset management" and, in general, evaluating the direction of UDOT's asset management program annually
- Asset Advisory Committee (AAC) formed to "enhance communication flow between the strategic work of AMSC and the 'boots on the ground'" technical experts. AAC chaired by Asset Management Director and consists of designated division leaders

Sets forth comprehensive view of program as consisting of 6 key components

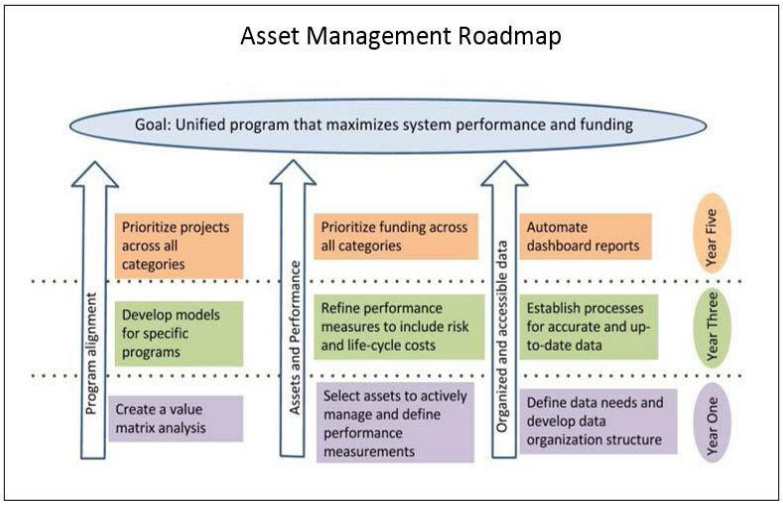
- Up until TAMP development, recommendations for the investment of UDOT's resources have been based on each asset funding category and program.
- To improve the strong efforts already made with bridges and pavement, UDOT is reconfirming existing asset management strategies and providing a comprehensive view of the asset management process as consisting of six key components:
  - Performance-based approach for allocating funds,
  - Organizational structure for asset management,
  - Data storage and accessibility,
  - Asset management ties to the long range plan,
  - Lifecycle cost analysis, and
  - Risk management.
- Each of these components aligns with the leading practice asset management framework, as shown below – demonstrating UDOT has done a good job aligning, at a conceptual level, the asset management program across the organization.

Analysis of prior gap analysis, identification of key focus areas for UDOT

- The three questions in the November 2013 gap analysis related to data showed the largest gaps and the highest importance of all the questions asked as part of the gap analysis. These questions focus on the organization and accessibility of data for business systems across UDOT.
- Three questions related to asset performance identified a need to focus on performance measures and different levels of management plans for assets.
- The remaining questions related to aligning programs within UDOT and with partners to ensure transparent and data driven decision processes are in place to build and maintain public trust.

One, three, and five year goals across three core asset management pillars

- The reorganized AMSC and AAC identified goals and objectives for the purpose of continuous improvement of asset management within UDOT.
- Objectives for 1, 3, and 5 year timeframes in each of the three major categories have been identified to reach this goal, forming the roadmap shown below:



Establishment of risk register and risk assessment process

- A risk register has been started as part of a risk assessment protocol to be carried out by individual Divisions.
- Focus of risk assessment is only on the extent to which goals and objectives in the Asset Management Roadmap across one, three, and five year time horizons are attainable and the risks that may limit attainability.
- A sample risk matrix generated within the Divisions – and included in the TAMP as an example – is shown below:

Probability \ Impact	L	M	H
H	4	7	9
M	2	6	8
L	1	3	5

- TAMP also sets forth three asset tiers, with the "highest value" assets (pavement and bridge) in tier 1 and other progressively lower value roadside assets in tiers 2 and 3.

Projection of asset condition and UDOT financial performance

- Sets forth funding needs to sustain tier 1 assets in good condition through 2030.
- Projected funding levels also included for capacity projects already programmed and included in the LRTP.
- TAMP also provides analysis of tier 1 asset conditions if funding were held at current levels, indicating deterioration patterns and timelines.

2) UDOT Asset Management Vision

Asset Management Statements – Practices and Principles

In the second workshop, held in January 8, 2015, UDOT worked through key components of its asset management program and – based on how it wanted the program to evolve over time – defined several asset management statements and principles. These statements and principles are all based on IAM leading practice asset management framework's building blocks of asset management. Both the statements and principles included below reflect feedback and input from the working group that attended the workshop, as well as the AMSC, which reviewed the statements and principles at its January 2015 meeting.

Asset Management Statements

Asset Management Definition

Ideas discussed at workshop

- Define AM in the vision
- Make responsible decisions by always considering lifecycle cost
- Maximize performance and minimize lifecycle cost
- Should be a process engrained throughout the department which, throughout generational changes, continues to evolve and occur – AM needs to be sustainable
- Right decisions at the right time at the right cost

Asset Management Definition
Coordinated innovative approach to analyzing, planning, investing, building, maintaining and operating our assets *to "keep Utah moving"*.

Importance / Impact of Statement

- Statement stresses importance of different stages in the lifecycle of the asset.
- Coordinated approach indicates that UDOT understands the relation between all processes and activities of the asset management framework
- Clear reference has been made to UDOT's organizational vision
- Commitment to coordinate separate processes into innovative asset management approach

Asset Management Success

Ideas discussed at workshop

- Having an asset management program and being able to make evaluations
- Success is driving the mission and vision of our organization

- Effectively, efficiently, and economically managing all assets under UDOT's control through each phase of their lifecycle
- Balancing the funding of different projects across the state

Asset Management Success
Driving the mission and vision of our organization by effectively, efficiently, and economically managing assets throughout their lifecycle.

Importance / Impact of Statement
- Asset Management Success is the result of a good translation of this overarching statement in SMART asset management objectives.
- Asset level KPIs are derived from the these objectives
- The AM objectives should help UDOT to realize its organizational objectives
  - What is effectively?
  - What is efficiently?
  - What is economically?
- Smart objectives can be monitored, reported and should lead to corrective actions for the Strategic Asset Management Plan

Management of Asset Risks

Ideas discussed at workshop

- Risk is a key concept to demonstrate value
- Risk is a tie-breaker for prioritization
- Risk is a key driver for identifying department needs
- Risk should determine not only needs but also the right asset management activities
- Risk is integral to determining not only where to spend the last dollar, but also where/how to spend the first dollar
- Risk is a tangible translation of values to decisions

Management of Asset Risks
Balancing decisions based on lifecycle costs and minimizing or eliminating risks.

Importance / Impact of Statement
- Risk is an important criteria for optimized asset management decision making, besides lifecycle costs, performance and/or other criteria which are important regarding UDOT's vision, mission and strategy
- Processes and procedures can now be put in place to identify, analyze and evaluate asset risks
- Risk management will provide support for emergency management and reduce fire-fighting where justified.
- Risk needs to re-evaluated periodically, providing impetus to the integrated planning principle, to account for changing conditions & information.

Asset Management Analytics

Ideas discussed at workshop

- Should include "institutional knowledge and experience" in making decisions.
- Should build on existing data and improve over time
- Should leverage complete and accurate information
- Should proactively explore new practices, processes, and innovations
- Level of analytics and data doesn't have to be the same for all assets and activities – will be varied across the organization
- Institutional knowledge needs to be part of analytics and decision-making, but it can't be the only factor to drive AM decisions

Asset Management Analytics
Proactive asset management decisions driven by consistent, accurate, and timely information – and informed by institutional knowledge – with appropriate levels of analytics and data.

Importance / Impact of Statement

- Strong statement supporting a life cycle oriented Total Expenditure decision making model
- Proactive decision making means that UDOT needs to have a clear understanding of demand planning and strategic planning
- Appropriate levels of analytics and data implies understanding the value of the decision and the cost of the data
- Consistent, accurate and timely information is only possible when efficient data registration procedures are developed, implemented and maintained

Asset Management Principles

Ideas discussed at workshop

- Assets should create value for UDOT and its stakeholders
- Asset Management helps to translate UDOT's strategies and objectives into an optimal decision making framework and Asset Management Plan
- Asset Management at UDOT will be an open, transparent, and easily understood and replicable decision-making process
- Asset Management decisions will be made based upon quality data, assets' risks, and whole-life-cycle-costs and performance
- Asset Management seeks solutions for the tension between available financial resources and required financial resources
- Asset Management activities will be continually reviewed and improved
- Not all assets are created equal – we can't treat everything like pavements
- Not all asset failures and asset risks are the same

- Top-down alignment from UDOT leadership to field staff, along with alignment across the organization's silos, is essential for effective asset management decision-making
- Asset Management relies on people making informed decisions

Asset Management Principles

1) Our focus is to deliver value through our assets for our stakeholders
2) We apply integrated planning to achieve infrastructure sustainability
3) We rely on people making informed risk based decisions
4) We apply the right level of detail for each asset class
5) We foster coordination across the Department
6) We promote a culture of innovation
7) We continually improve our asset management processes

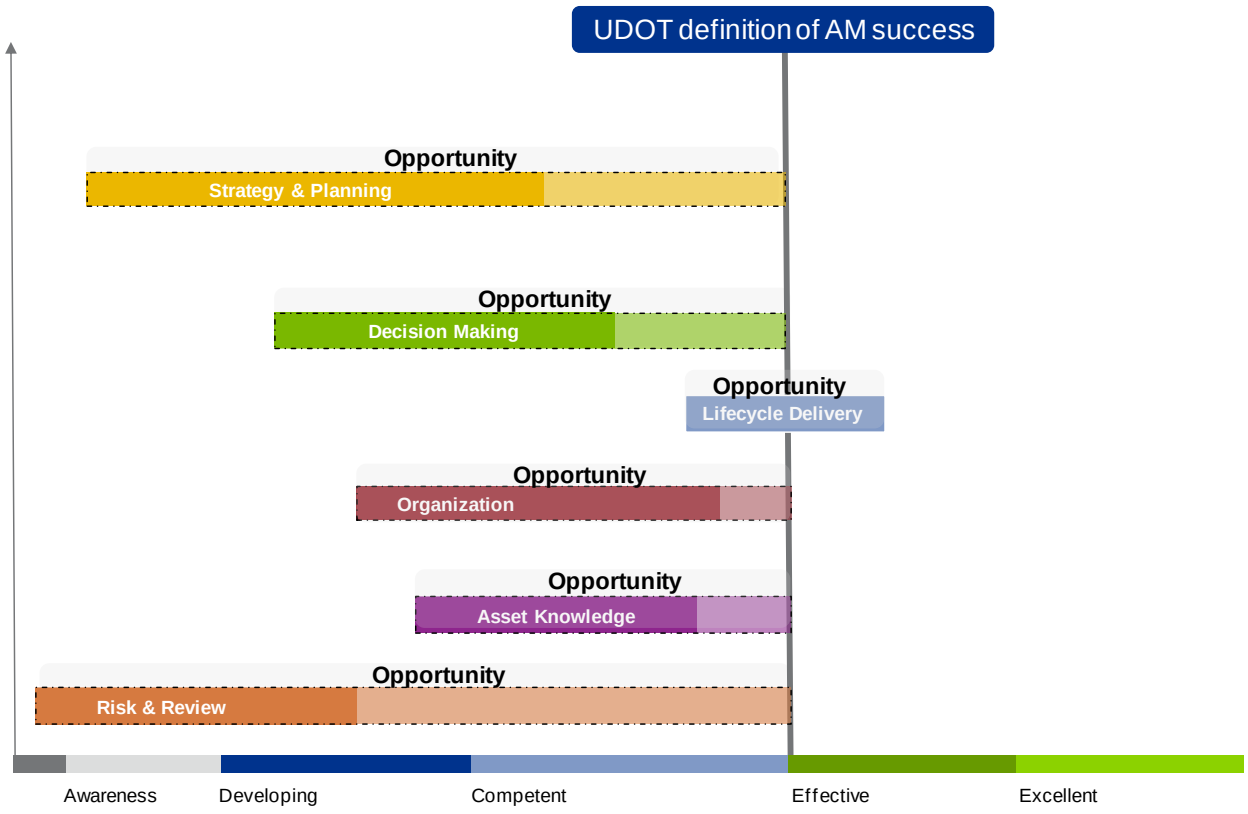
Importance / Impact of Statement

- Agreement on the asset management principles is a critical step in writing the Strategic Asset Management Plan (AM Strategy).
- Accepting the principles also means that UDOT accepts the consequences of these principles
    - The AM needs of all stakeholders need to be identified by a stakeholder analysis (principle 1)
    - Understanding how much an AM activity contributes towards its strategic goals and its stakeholders' value (principles 1 & 2)
    - An integrated process for making AM decisions across departments (principles 2 & 5)
    - A risk register needs to be available, and the processes to continually identify and analyze risks needs to be in place (principle 3)
    - Processes need to be installed to maintain, review and update all AM process (principle 4)
    - Asset Management should build on UDOT's strength of continuously testing new approaches (principle 6)
    - UDOT needs to develop process to keep up with best AM practices (principles 6 & 7)

3) Opportunities for Improvement

Opportunity Identification and Evaluation Methodology

KPMG identified opportunities based on a gap analysis comparing how UDOT defines asset management – as a coordinated innovative approach to analyzing, planning, investing, building, maintaining, and operating assets to "keep Utah moving" – with the output of the current state self-assessment. The project team also took into account the various current initiatives underway at UDOT and the extent to which these activities were aligned and supporting one another. Within that context, the project team reviewed opportunities that had the potential to not only drive the program forward through the creation of new processes, policies, and initiatives but also to streamline and integrate the asset management activities already in place. Finally, the project team kept in mind specific guidance and comments made by attendees at the first two workshops.



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appeal to the largest number of principles possible, inherently not all opportunities will apply to all principles equally.

PM Review performance measures (PMs) and level of service (LOS) targets

- A targeted review should focus on LOS targets and PMs for defined asset classes, regions/corridors, or simply the metrics UDOT suspects are not correct; or UDOT can conduct a comprehensive review of all PMs and LOS targets.

Principles: 1, 2, 5, 7

FL Implement field activity feedback loops

- Develop processes in following areas to address current lack of feedback loops: tracking new initiatives / pilot projects, data / documents / asset management systems, major maintenance contracts.

Principles: 1, 5, 6, 7

RM Expand current risk matrix into organizational risk framework

- This should take into account the newly formed vision and principles for asset management, leveraging work already done as part of cross-asset allocation projects.
- Risk management at the asset level presently – should expand to an organizational / programmatic approach.

Principles: 1, 2, 3, 5

DR Dashboard reporting (financial – technical – operational)

- Should leverage quality asset data UDOT already has to more effectively – and quickly – communicate operational input & maintenance outcomes both externally and internally for improved asset management decision making, including financial, operational and technical reporting. This will also assist in UDOT's aspirations of being a transparent organization.

Principles: 2, 3, 4, 5, 7

DSG Data / document strategy and governance plan

- Develop a plan and corresponding implementation strategy to align UDOT's data and document systems and initiatives. This will integrate and enhance business intelligence across the organization.

Principles: All

IP Integrate long-range planning with STIP

- Implement protocol to ensure STIP projects are consistent with and contribute towards outcomes of LRTP and UDOT's newly formed asset management vision and principles.

Principles: 1, 2, 4, 5, 7

LCC approach for non-pavement assets (improving bridge, roadside, fleet, facilities)

- Increase understanding of Life Cycle maintenance Costs and asset replacement investments of non-pavement assets across the asset lifecycle.

Principles: 1, 2, 4, 5, 7

Organizational "values matrix" for optimized asset management decision making

- Develop transparent analytical process for determining the extent to which assets / projects contribute towards UDOT's strategic goals and objectives.

Principles: 1, 2, 3, 5, 7

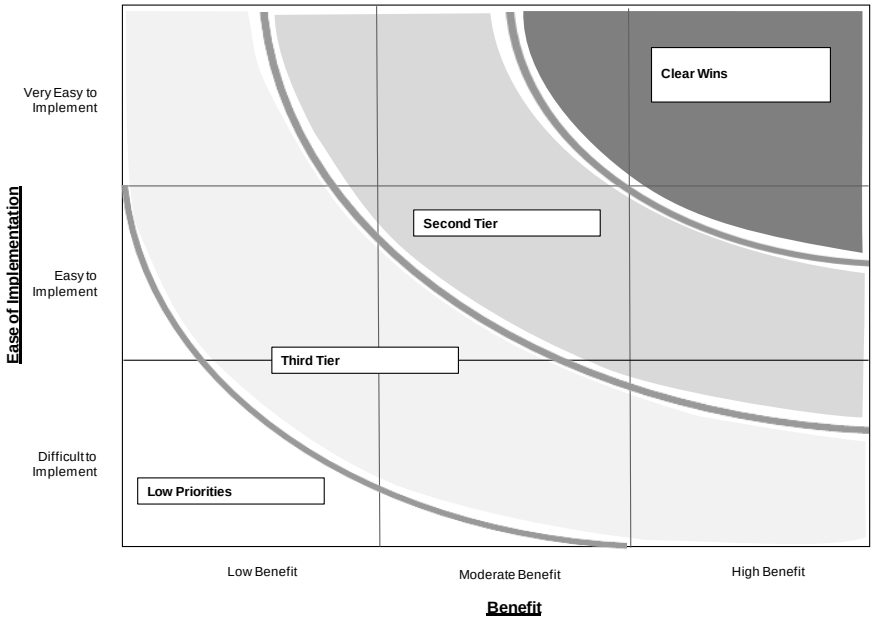
Asset management maturity strategy by asset class

- Determine extent and scope of asset management program and associated activities by each asset class. This will assist in the development of a unified programmatic approach to asset management.

Principles: All

After identification and review of potential opportunities for improvement, each opportunity was scored across two criteria – ease of implementation and benefit of implementation. Taken into account for both were monetary and non-monetary factors, including (but not limited to): amount of cultural / organizational change required, political considerations, policy initiatives, complexity, and leadership preferences.

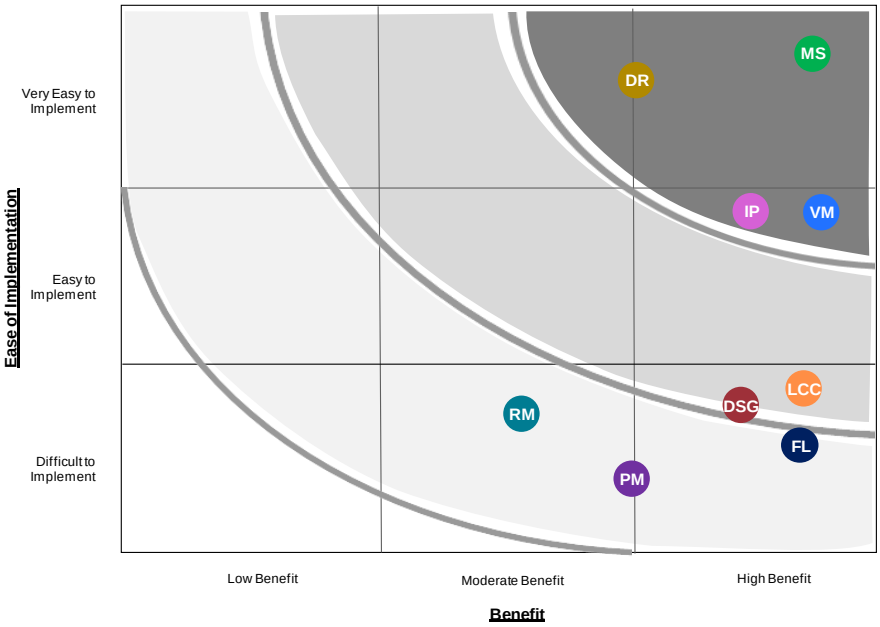
With ease of implementation as the y axis and benefit of implementation as the x axis, the project team plotted the opportunities on a scatterplot divided into four tiers, as shown below.



Clear wins were defined as those opportunities which were deemed very easy to implement (accounting for the aforementioned considerations) and had a high benefit of implementation. The categorization of tiers progressed down the value chain to low priorities, which were those opportunities with low implementation benefits and high difficulty of implementation.

UDOT Evaluation of Implementation Opportunities

The scatterplot below depicts rankings of the opportunities following the final implementation workshop in February 2015.



In the final workshop, UDOT started to work through assessing the relative implementation cost-benefit of each implementation opportunity. Midway through this process, workshop attendees noted the linkages between the various options and that virtually all assets could stand to benefit from the implementation of some degree of the alternatives. For example, bridges and pavements could benefit from implementing the alternatives within each asset category – from a data and strategy governance plan just for pavement (and bridge) data to dashboard reporting developed exclusively for pavements (and another set of dashboards developed exclusively for bridges).

Attendees raised the idea of developing a framework for each asset class, defining the requirements for each implementation opportunity. Returning to the example of pavements, this framework would indicate (among all nine implementation opportunities): the appropriate level of data required for pavements, the maturity strategy for asset management practices related to pavements, and how integrated planning for pavements could be achieved.

Participants noted that this approach would lead to relatively siloed outcomes.. However, they also stated that doing so could serve as an interim step before integrating all frameworks into a broad-based, organizational approach across all asset classes and implementation options. In this sense, this asset class by asset class approach would be a near-term means of getting the asset management maturation process "off the ground" and ensuring quick wins. To that end, participants suggested that this approach be piloted within one asset class to trial the framework development process. With the benefit of lessons learned and resulting process improvements, this framework development could then be applied to a larger number of assets as a refined process.

Workshop participants noted that this process would lead to a consistent, defensible, transparent, and replicable means of working to mature core asset management capabilities within UDOT.

UDOT Draft TAMP – Analysis and Opportunities for Improvement

A TAMP is not a process or a document unto its own, but rather the culmination of a broader endeavor to define the organization's strategic asset management vision and objectives. As such, it needs to communicate a unified, aligned asset management strategy and vision both at the top level as well as reflected throughout the organization's asset management activities at a technical (bottom-up) level.
While the TAMP does indeed address the fact that asset management cannot effectively exist in an organization that operates within silos – aligning the core elements of UDOT's asset management program with the six building blocks of the leading asset management framework – it does not have a defined scope. Asset coverage, the notion of what "counts" as an asset, as well as the criteria for determining asset importance, appear to be absent from the TAMP. Does UDOT consider, for example, its human resources an asset? What about the industry-leading

quantum of data it has gathered? If so – such classifications are not communicated in the TAMP, nor is the importance of that (those) asset(s). Importance, in this sense, is not driven only by "value" – which UDOT has included in financial terms in its asset tiers – but rather by asset criticality. Asset criticality is a function of the underlying value of an asset – both financial and economic – paired with the risk profile of that particular asset relative to others.

While UDOT has introduced the concept of risk in its TAMP, it has done so within a confined context – specifically in terms of barriers the Asset Management Roadmap divisions may encounter. While this risk register has been started, it remains decoupled from not only field maintenance activities but also broader-based organizational strategic objectives and UDOT's asset management vision. Perhaps most importantly, risk analysis – as laid out in the TAMP – is not included in the asset management decision-making process. As currently laid out, the risk information conveyed in the TAMP is useful, "good-to-know" information about the TAMP itself, but should be decision-useful from an organizational asset management perspective.

Similarly, the strategic goals and objectives in the TAMP – while good context – appear to be unlinked to decision-making processes at both the strategic and technical / operational levels. Strategic goals and objectives, within the context of the TAMP, exist in isolation of asset management processes, policies, and Roadmap. In an organization unified by its guiding vision, principles, and goals – these goals and objectives would be clearly reflected throughout the TAMP, tangibly influencing policies and processes across the organization.

One element of this organizational alignment is addressed within the context of UDOT's data collection initiatives. Within the TAMP, there is significant discussion of being able to make data-driven decisions and – broadly – a discussion of maintenance data at an organizational level. As UDOT collects more and more data, however, the focus of the organization needs to move from data collection to analytics and the ability to drive value (business intelligence) through the data. UDOT is currently working towards this outcome with the data warehouse project. However, still missing is an overarching data strategy – including a set of governing objectives that not only dovetails with broader organizational goals / objectives but also establishes the level of detail required for each asset class.

Broadly, the notion of "value" in asset management needs to be more prominently featured in the TAMP. From asset risk to asset data, the notion of driving value is the key to effective asset management – and is what distinguishes practicing "asset management" from merely managing the organization's assets. Another area where this notion of value can be integrated into the TAMP is within the context of lifecycle costing. Presently, lifecycle costing is done for all pavement assets – other tier 1 assets (bridges) are not analyzed as part of a lifecycle cost methodology. This lifecycle cost is based solely on historical cost (original financial replacement cost) and does not

incorporate the notion of economic cost, current financial cost, or – more broadly – the two fused together with risk, translating into value.

Data Practices – Analysis and Opportunities for Improvement

UDOT has collected a significant amount of data for its pavement and bridge assets, formalizing a collection process and tying the data to related decision-making processes. Other non-tier 1 assets, by contrast, do not have consistent levels of data across asset classes, nor is there a standardized process in place for data collection or tying the data into asset decision-making processes.

To support enhanced asset management maturity, UDOT should standardize levels of data collection and collection processes for its non pavement/bridge assets to establish consistency across asset classes. As UDOT has already begun the push towards integrated data (via the data warehouse, among other initiatives) ensuring useful and consistent data in non-tier 1 asset classes is essential to ensure integration success.

UDOT should continue along the path of data integration and – in so doing – begin to transition from data collection for pavement and bridge assets to focusing on driving business intelligence and decision-useful data analysis from the data currently collected.

Conclusion

Opportunities for Improvement – Implementation Options

KPMG identified opportunities for improvement of UDOT's asset management strategy based on a gap analysis comparing how UDOT defined asset management – as a coordinated innovative approach to analyzing, planning, investing, building, maintaining and operating assets to "keep Utah moving" – with the output of the current state self-assessment. The project team also took into account the various current initiatives underway at UDOT and the extent to which these activities were aligned and supporting one another. Within that context, the project team reviewed opportunities that had the potential to not only drive the program forward through the creation of new processes, policies, and initiatives but also to streamline and integrate the asset management activities already in place. Finally, the project team kept in mind specific guidance and comments made by attendees at the first two workshops.

Nine opportunities for asset management improvement were identified and are listed below. As part of the opportunity identification and review process, each opportunity was evaluated against the seven key asset management principles identified by UDOT in the visioning workshop. While opportunities were created to appeal to the largest number of principles possible, inherently not all opportunities will apply to all principles equally.

Review performance measures (PMs) and level of service (LOS) targets

- A targeted review should focus on LOS targets and PMs for defined asset classes, regions/corridors, or simply the metrics UDOT suspects are not correct; or UDOT can conduct a comprehensive review of all PMs and LOS targets.

Principles: 1, 2, 5, 7

FL Implement field activity feedback loops

- Develop processes in following areas to address current lack of feedback loops: tracking new initiatives / pilot projects, data / documents / asset management systems, major maintenance contracts.

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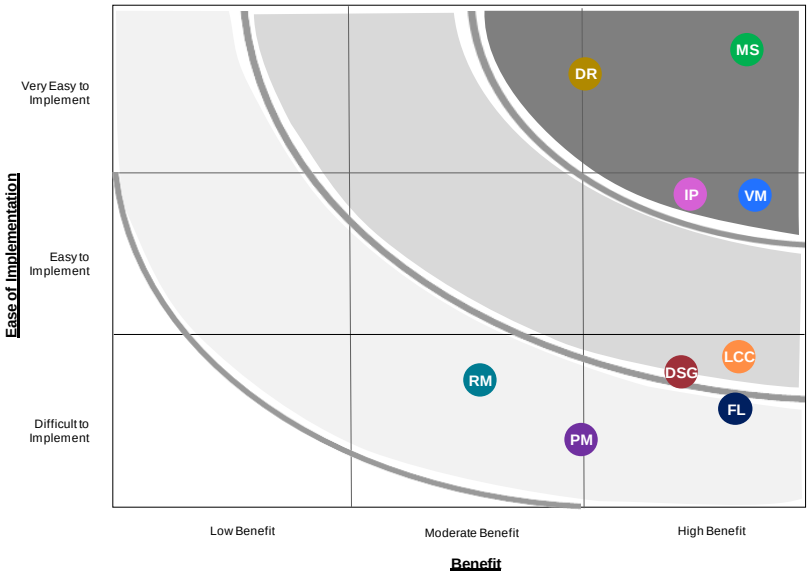

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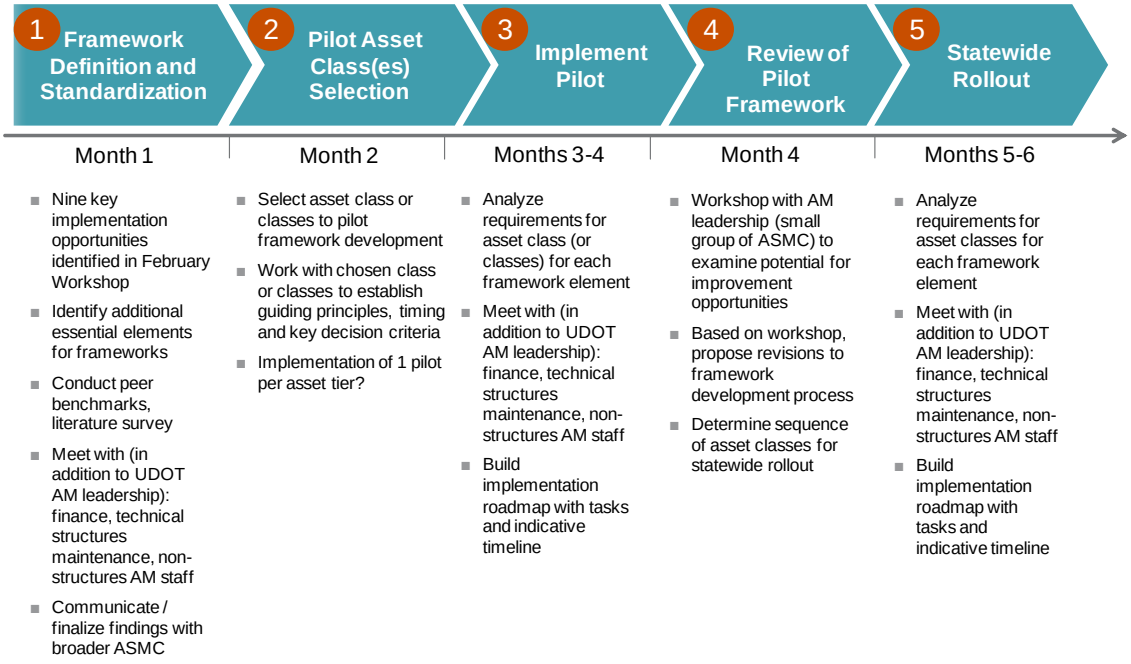
strategy governance plan just for pavement data to dashboard reporting developed exclusively for pavement.

During the workshop the idea of developing a framework for each asset class defining the requirements as they related to each of the implementation options was discussed. Participants noted that this approach would lead to relatively siloed outcomes – that the resulting frameworks would only apply to one asset class. However, they also stated that doing so could serve as merely an interim step before integrating all frameworks into a broad-based, organizational approach across all asset classes and implementation options. With the benefit of lessons learned and resulting process improvements, this framework development could then be applied to a larger number of assets as a refined process.

A potential implementation roadmap for development of these frameworks is shown below. This roadmap could – over the course of approximately six months – deliver a pilot framework for a select group of assets and incorporate lessons learned into a full roll-out for the remainder of the defined asset classes.



UDOT TAMP – Analysis and Opportunities for Improvement

The TAMP is not a process or a document unto its own, but rather the culmination of a broader process to refine the organization's strategic asset management vision. As such, it needs to communicate a unified, aligned asset management strategy and

vision. UDOT could stand to benefit by revising its TAMP to better reflect this philosophy. This revised TAMP will serve as an updated, comprehensive foundation for UDOT's asset management program – a guiding document by which UDOT can drive value across the organization.

While the TAMP does indeed address the fact that asset management cannot effectively existing in an organization that operates within silos – aligning the core elements of UDOT's asset management program with the six building blocks of the leading asset management framework – it does not address scope. Asset coverage, the notion of what "counts" as an asset, as well as the criteria for determining asset importance, are decidedly absent from the TAMP. Does UDOT consider, for example, its human resources an asset? What about the industry-leading quantum of data it has gathered? If so – such classifications are not communicated in the TAMP, nor is the importance of that (those) asset(s). Importance, in this sense, is not driven only by "value" – which UDOT has included in financial terms in its asset tiers – but rather by asset criticality. Asset criticality is a function of the underlying value of an asset – both financial and economic – paired with the risk profile of that particular asset relative to others.

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UDOT should continue along the path of data integration and – in so doing – begin to transition from data collection for pavement and bridge assets to focusing on driving business intelligence and decision-useful data analysis from the data currently collected. Specifically, UDOT should continue affording public access to its high-quality data collection via its external website. Such efforts will be augmented as UDOT potentially begins to implement dashboard reporting as a part of the development of asset frameworks. Formation of these dashboards should take into account what information the public would like to know – focusing on supplying this level of data detail rather than communicating the data UDOT thinks the public wants to know, or what UDOT merely wants the public to know.